

## West Nile virus and other fears: opportunities to foster partnerships

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### Introduction

Fire Island National Seashore is located off the south shore of Long Island in New York State. The park is the middle 26 miles of the 32-mile-long barrier island. There are 17 communities in the western half and an eight-mile-long designated wilderness (the Otis Pike Fire Island High Dune Wilderness Area) in the eastern half.

The year 2000 marked the third consecutive year that Fire Island National Seashore surveyed the mosquito population in the park. Fire Island, particularly the Otis Pike wilderness area with its vast stretches of salt marsh, is infamous for the large numbers of aggressive mosquitoes that breed (and feed) there in the summer. Although they have been quite limited as disease vectors, the vast majority of people view salt marsh mosquitoes as a nuisance species. Visitors unfamiliar with mosquito biology may be left with the impression that the huge numbers are not only an incredible nuisance but also a fearsome health threat.

The park mosquito management plan calls for collecting data on two species of mosquito primarily: *Culex pipiens* (the common house mosquito) and *Aedes sollicitans* (the salt marsh mosquito, with a blunt abdomen). *C. pipiens* is often identified as "PRE," while the *A. sollicitans* is often abbreviated to "SOL." SOL was the focus species in a study in the 1980s, which has helped the park with recent emergence of the West Nile virus (WNV) issue. In 1998 and early 1999, studies focused on SOL, with PRE becoming the focus late in the 1999 mosquito season and on to the present. Here, I will be discussing primarily PRE.

The 1980s studies were concentrated in the eastern half of the island and in the adjacent park unit called the William Floyd Estate (WFE). In the park's 1998 mosquito management plan, we used six Centers for Disease Control and Prevention (CDC) light traps in these areas. Pools of 50-100 specimens were tested each week for eastern equine encephalitis (EEE) and all were negative for the disease. This was continued in 1999 and all pools sent for testing were negative. In 1999, toward the end of the program season (June-September), WNV (then thought to be St. Louis encephalitis) was added to the list of potential mosquito-borne diseases that could be found in the New York metropolitan area.

### Trapping mosquitoes

The park's mosquito surveillance program is not only designed to find out if EEE or WNV is on Fire Island and to what extent. It is also a good example of integrated pest management, taking into account several factors in the management of mosquitoes in an effort to prevent unnecessarily introducing substances into the environment that may be harmful to humans or other life. In accordance with the park's mandate of preserving natural processes, it is an approach that does not dismiss the right of mosquitoes to exist because they cause discomfort, but acknowledges the mosquito's integral role in natural processes.

Over the summer of 2000, a minimum of nine traps were set out once a week in carefully selected areas of the WFE and from Smith Point to the lighthouse on Fire Island. Traps were generally placed in or close to standing water, with the gravid

traps placed in freshwater sites. The gravid traps collect only female mosquitoes attempting to lay eggs on the water found in the trap.

Traps were relocated in the same general area if they did not produce at one particular site. In September and October more traps were placed in additional locations on the island. This enabled a more detailed picture of where mosquitoes were most or least active, and the location of any virus present.

Each week ten pools of 50 mosquitoes from park traps were sent in for testing. All proved to be negative for the presence of WNV. Suffolk County Vector Control (SCVC) monitors mosquitoes on Long Island. It set up traps in communities near the park, and in September found one pool of mosquitoes in Saltaire that tested positive. Subsequently, SCVC received permission from the park to aerially spray adjacent park properties with pesticide. The weather soon grew cool enough to reduce the number of airborne mosquitoes to a level where spraying would not have been effective.

Because birds are intermediate hosts for WNV, dead birds found on Fire Island were collected and taken to SCVC for testing (the protocol used for collecting and handling dead birds may be found in the Fire Island mosquito action plan). All were found to be negative for the virus.

Mosquitoes were collected using incandescent light and dry ice as bait for the CDC light traps and an organic liquid as bait for the gravid. This mixture was supplied by SCVC. Six-inch squares of dry ice were hung next to each CDC light trap and the organic liquid was placed in plastic tubs over which the gravid traps were suspended, about 1 inch from the surface of the liquid.

Both kinds of traps operated on the same general principle, consisting of a tube with a fan and a motor, and a net attached at one end. Mosquitoes attracted to the bait were drawn into the tube and then the net by the flow of air produced by the fan. A six-volt sealed lead battery drove the trap's motor.

Trap sites were chosen in consultation with H. Ginsberg (U.S. Geological Survey Biological Resources Division) and the author. For the most part, sites were placed in or near permanent or semi-permanent standing water. Gravid traps were placed in or near freshwater, determined by the presence of ferns, rushes, cattails or other freshwater plants. If a trap placed at one site did not catch mosquitoes within one to three weeks, it was moved to another nearby site. Occasionally traps were moved to be in closer proximity to people. SCVC trapped in one remote area of WFE to conserve collection time.

Trapping was completed once a week from July 17 to October 21. Traps were generally set out in the late afternoon and picked up the next morning as early as possible. Typically, traps were put out on Tuesday, after the dry ice was obtained. If it was raining, traps were set on the next dry day. If it rained all week, traps were set out under umbrellas to protect the gravid trap water from overflowing. Once trapping started for data collection, it was quickly determined that traps should be set out and collected by Thursday afternoon to allow for enough time to sort and count their contents and take them to SCVC by early Friday afternoon.

Trap nets and batteries were collected after approximately ten to twelve hours of operation and the nets put on dry ice until the mosquitoes were sufficiently inactive to remain stationary for the length of time it took to sort and count each pool. Due to the limited number of batteries, and the limited number of connections on the battery charger, it was necessary to charge them up as soon as they came in from the field. In the interest of safety, only a battery charger with a "trickle charge" setting was used. This setting allows the battery to remain on the charger indefinitely until it could be attended to.

With nine (and occasionally ten) trap sites covering the entire length of Fire Island and the WFE, we were under a very tight schedule. So it was decided, after consulting with S. Campbell (SCVC) and Ginsberg, that trap contents should be sorted only into the two vectors: *Culex pipiens-restuans* and *Aedes sollicitans*. The

total number of mosquitoes in each trap was estimated by a visual method supplied by Ginsberg. Once this was done, groups of approximately 100 to 200 mosquitoes were removed. From these groups, pools of PRE and SOL were obtained in quantities of 10 (minimum pool size) to 50 (maximum pool size). The pools and the remaining mosquitoes were placed in labeled plastic petri dishes and taken to SCVC. From there, they were sent out for testing.

Larval sampling was done on two occasions in 2000: August 14 at the WFE and August 31 at Smith Shores. At the WFE, three larvae were found in the gravid trap freshwater site and one near the light trap in the salt marsh. One larva from the gravid trap site was identified as *Aedes cantator*. No larvae were found at Smith Shores.

Consistently, the greatest number of mosquitoes was found in the light trap at Smith Shores in the Otis Pike wilderness area. At this trap, total numbers of mosquitoes stayed in the four- to five-digit range during the weeks July 31 to October 9, with PRE topping 1,000 in the second to the fourth week of August and again in the middle of September. *Aedes sollicitans* remained over 1,000 from the weeks of July 31 to August 28, with a small blip occurring in the week of September 11. None of the traps at the WFE produced in excess of 1,000 (total) mosquitoes.

The number of *A. sollicitans* relative to *C. pipiens-restuans* remained high (greater than 3:1) at Smith Shores from July to the end of August. This is in contrast to the WFE, where the ratio remained roughly 1:1 for most of the summer.

In the gravid traps at the WFE and Hospital Point, as in the light traps, the highest number of mosquitoes occurred in the middle of August. As expected, the gravid traps caught egg-bearing *C. pipiens-restuans* almost exclusively, although the numbers were generally well below those in the light traps, never surpassing 100 specimens.

The traps at Watch Hill followed the same general trend as the traps further east, with peak periods occurring during August. Interestingly, the gravid trap at Watch Hill produced the most PRE during the week of July 17, when it was set for the first time.

Numbers in the Watch Hill light trap were estimated to be over 4,000 (total) mosquitoes for the two weeks it was set out, with the number of *C. pipiens-restuans* close to 1,000 for both weeks. The ratio of *C. pipiens-restuans* to *A. sollicitans* in the Watch Hill light trap varied, but the number of SOL remained in excess of *C. pipiens-restuans* for both trap weeks.

The Talisman light trap caught only four mosquitoes, even in a week where numbers were slightly up elsewhere. The trap location was moved to a new location in the same general area, but with no significant increase in the number caught. None of the traps west of Watch Hill caught more than about 300 mosquitoes in a trap night. The peak period was, again, the middle of August. The Sunken Forest gravid trap produced the most mosquitoes of any trap in the west in a single night, in the week of August 7, and proved to be more successful than any of the gravid traps in the east.

The Sailors Haven light trap location was changed several times. When it was moved to a new site near standing water it captured about seven times the total number of mosquitoes than in each of the preceding weeks. This trap often had large numbers of non-target mosquitoes, mostly other *Aedes* species. The Sunken Forest light trap was placed in the western end of the forest when WNV was found at Saltaire, a discovery that triggered some discussion about spraying the forest. This trap produced relatively low but significant numbers of *C. pipiens-restuans* in the first two weeks of its operation. The ratio of *C. pipiens-restuans* to *A. sollicitans* was generally higher in the western light traps than in the eastern traps on the island, usually roughly 1:2 or 1:1.

The lighthouse gravid trap was the most productive of all the gravid traps used in 2000. It produced over 40 specimens at least half of the time during the peak month

of August, and again in mid-September when it was moved closer to the Kismet pond in response to the presence of WNV at Saltaire.

### **Park actions and suggestions**

Each week a report of mosquito numbers and pools was sent to the park headquarters staff. This enabled the park to answer any visitor or constituent questions. The reports demonstrated that the park was taking sufficient action and prevented fears of a WNV outbreak originating in the park.

A park committee made up of representatives from each branch of the staff developed a mosquito action plan (MAP). This had four levels of action: from public education and monitoring to possible spraying for mosquitoes and closing areas of the park if the virus was found. The MAP also contained instructions for bird carcass removal and transport to SCVC for WNV testing. Eight large black plastic trunks were set up with equipment that might be needed if we had advanced through the four levels of action. The four action levels parallel the four levels of mosquito monitoring found in the protocols set up by Ginsberg.

The MAP and mosquito monitoring in 1999 and 2000 enabled the park to collect data on the mosquito population and monitor for any possible WNV. In 2001, the park will again be using the same basic protocols, with education and area sanitation as the first line of defense. As the mosquito numbers increase, the protocols call for increased trapping, larval counts, or both. If a positive pool or infected bird is discovered, the basic action will be increased trapping in that area to identify the degree of threat to the human population. There is also some concern for the effects of WNV on area bird populations. Continued study is underway in this region.

At this time PRE is the primary mosquito found to carry WNV. If others are discovered they will also be collected for testing.

Education remains the first line of defense. The compact disc entitled "Neato Mosquito," put out by the CDC, is a good reference, along with folders from other governmental health agencies and the park. The park continues to work with its many partners and cooperators to ensure that the best information is made available to the public.